SIKA®
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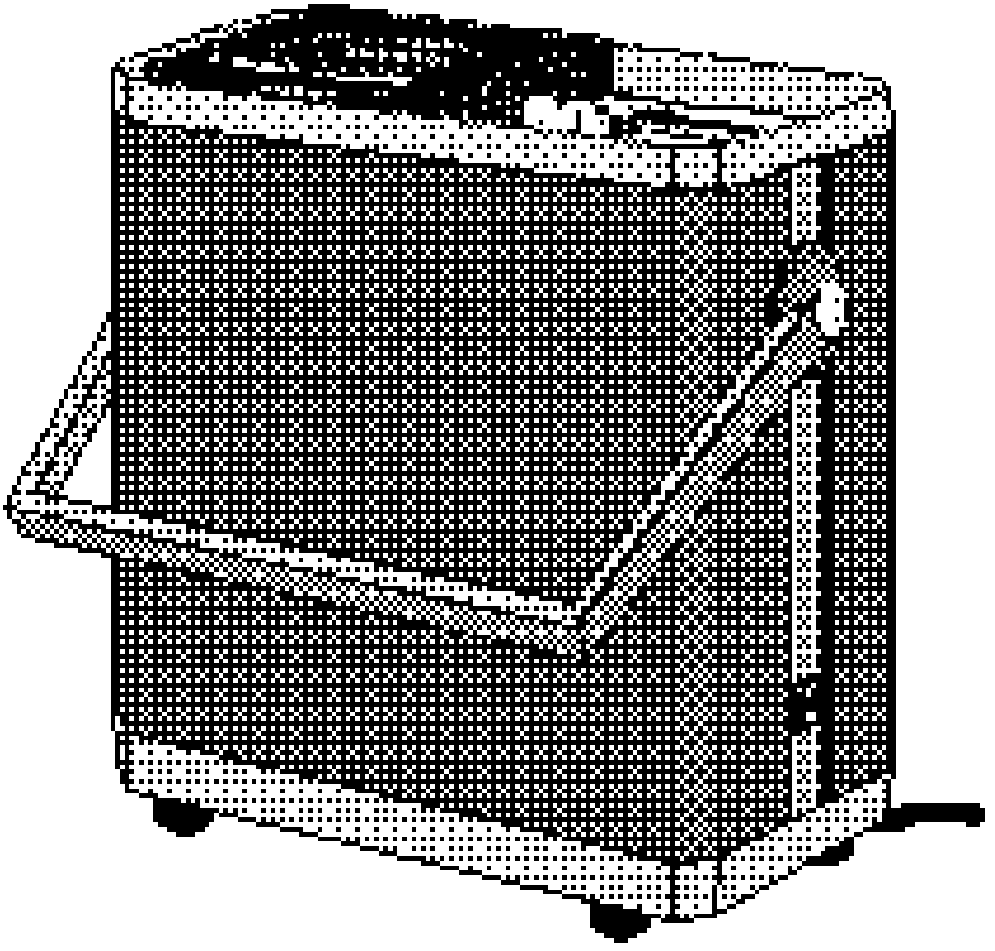
Dr. Siebert & Kühn GmbH & Co. KG

Precision-Temperature-Calibrator

Series TP28850E

User Manual



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1 To this user manual

The SIKA-Precision-Temperature-Calibrator is an instrument of the TP28000 series. This instrument is exactly a type TP28850E one.

This user manual is focussed to skilled and semi-skilled operators.

Before starting an operation carefully read through the appropriate notes and follow the given sequence of operations.

Read through chapter ‘Safety’ very thoroughly and exactly remember the pictograms and their meanings.

The instrument is designed for the calibration of temperature switches, thermostats, thermocouples, thermometers and resistance thermometers.

This user manual is divided into eight chapters:

1. General
2. Safety
3. Description of the TP28850E
4. Transport, storage and starting the instrument
5. Operating the TP28850E
6. Maintenance and care
7. Trouble shooting
8. Specification

For any problems or questions possibly arising, please contact your supplier or SIKA directly:

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2 Safety

The TP28850E represents the state of the art. This applies to measuring accuracy, functional principle and safe instrument operation. Warranting safe operation, however, requires expert and safety-reliable user attitude.

You will find the necessary notes in this chapter below. Warnings, especially related to single operating processes or manipulations, are given at the respective paragraphs of this manual. These warnings are marked by the following symbols:

Caution: High temperature!
This symbol refers to a situation being hazardous for persons.

Danger! Injurious to Health!
This symbol refers to jeopardizing persons by electric power.

Attention: Material damage!
This symbol refers to an action causing damages of the instrument.

Note: This symbol stands for important notes.

The warning:
Attention! High temperature
is directly placed on the instrument as shown below:

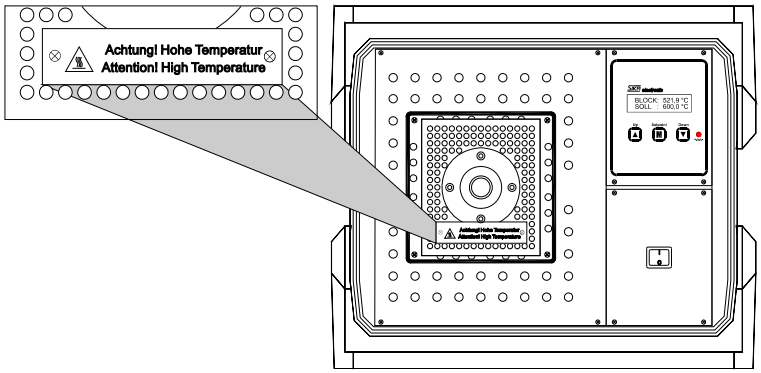

Fig. Magnification enlarge detail

Specific safety notes

Note: The TP28850E has to be exclusively used for testing temperature switches, thermostats, thermocouples, thermometers and resistance thermometers.

The TP28850E noise level is below 70 dbA.

Remove all easily flammable materials near the instrument and prevent the instrument from contact with easily flammable and explosive materials.

Always ensure sufficient cooling air supply by the built-in fans. Do not hinder air supply by positioning the instrument on a soft and yielding ground.

Connect the instrument to a circuit of low mains-breakdown risk to avoid cooling air supply being stopped in case of mains breakdown.

Ensure that adapter sleeves and specimen are not contaminated by media (e.g. oil) causing inflammation or explosion in case of being heated up.

Test the actual heating block temperature before touching a heating block or the adapter sleeve since there is acute danger of being burned.

Never remove adapter sleeves from a heated heating block - heated adapter sleeves can cause inflammation.

Never remove specimen from a heated heating block - acute danger of being burned.

Note: Never leave a heated Instrument without supervision.

3 Description of the TP28850E

3.1 Modular groups and operating components

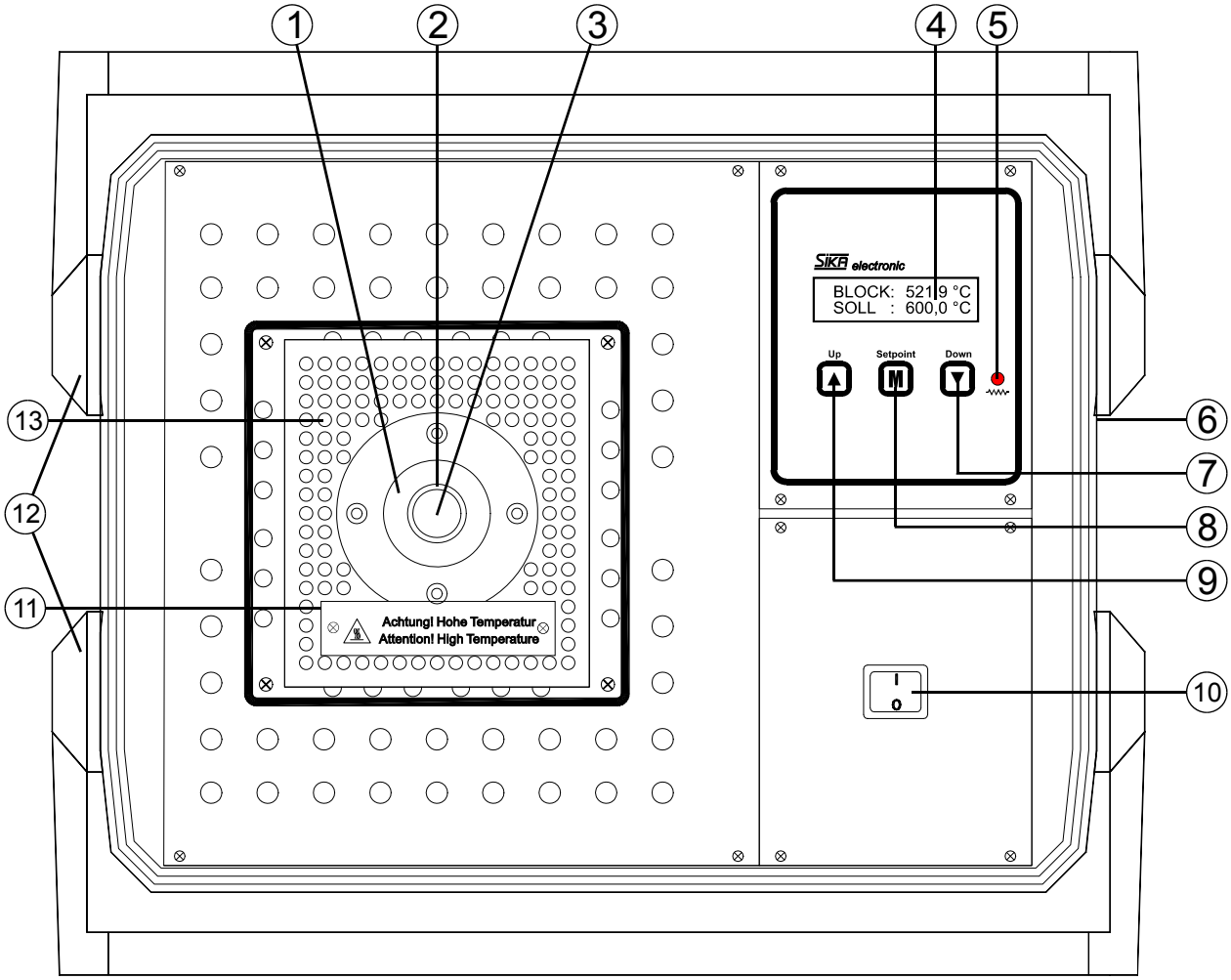

Fig. TP28850E front panel

1) Heating block
2) Heating block bore
3) Adapter sleeve
4) Display
5) Cycle display
6) Interface (PC connection)
7) Down key
8) Setpoint key
9) UP key
10) Mains switch on/off
11) Note
12) Latching knob
13) Protective grid

3.2 Design and function of the TP28850E

This precision temperature calibrator is operated by an electronically controlled heating block ① made of brass and allowing to be thermostated up to +850 °C. The heating block has a bore ② serving as location hole for the specimen. An adapter sleeve ③ can be inserted in that bore. The sleeve serves as an adapter between specimen (temperature switch, thermostat, thermocouple, thermometer, resistance thermometer) and heating block

Caution! The top side of the heating block is provided with a protective grid ⑬ and an overheat warning.

The display ④ indicates the temperature of the heating block and the desired heating block temperature or the temperature gradient.
The display indicates the temperature with a resolution of 1/10K.

Set the desired heating block temperature by manipulating the setpoint key ⑧ or the Down key ⑦ /Up key ⑨. It is possible to set the desired temperature with an accuracy of 1/10 K.

The RS 232C interface ⑥ is used to connect the instrument to a computer.

3.3 TP28850E standard units

3.3.1 Mains cable

A mains cable for power supply is enclosed to the TP28850E.

3.3.3 Sleeve grab

A grab for taking out the adapter sleeve is enclosed to the TP28850E.

3.3.4 PC connection

A data transfer cable is enclosed to the instrument.

The TP28850E is provided with a RS 232C serial interface. It is bidirectional, i.e. it is possible to transmit data for further processing by a superior computer and to receive data for programming the instrument by a superior computer as well.

The transmitting mode continuously transmits the actual block temperature. The transmitting protocol has 16 bytes total. All information is transmitted in ASCII.

Transmitting protocol

Byte	Value	Explanation	
0	02	STX (Start of Text, start of protocol)	
1	„b“ , „B“	„b“: Blocktemperatur ∗ 200°C, „B“: Blocktemperatur > 200°C	
2	„+“, „-“ „!“	mathematical sign of the block temperature invalid block temperature	
		block temperature ∗ 200°C:	block temperature > 200°C:
3	„0“ bis „9“	10^2 digit, block temperature	10^3 digit, block temperature
4	„0“ bis „9“	10^1 digit, block temperature	10^2 digit, block temperature
5	„0“ bis „9“	10^0 digit, block temperature	10^1 digit, block temperature
6	„0“ bis „9“	10^{-1} digit, block temperature	10^0 digit, block temperature
7	„0“ bis „9“	10^{-2} digit, block temperature	10^{-1} digit, block temperature
8	„b“ , „B“	„b“:block temperature∗ 200°C, „B“:block temperature> 200°C	
9 bis 14	„+00000“		
15	03	ETX (End of Text, end of protocol)	

The transmitting parameters are adjusted to:
9600 baud, 8 data bits, 1 stop bit, odd parity.

In the receiving mode a superior control computer can set new required values to the TP28850E for control of those functions key. The receiving protocol has 9 bytes total. All information is received in ASCII.

Receiving protocol

Byte	Value	Explanation
0	02	STX (Start of Text, start of protocol)
1	„E“	
2	„+“	sign required value
3	„0“ bis „9“ oder „X“	10^3 digit, required value
4	„0“ bis „9“ oder „X“	10^2 digit, required value
5	„0“ bis „9“ oder „X“	10^1 digit, required value
6	„0“ bis „9“ oder „X“	10^0 digit, required value
7	„0“ bis „9“ oder „X“	10^{-1} digit, required value
8	03	ETX (End of Text, end of protocol)

The receiving parameters are adjusted to:
9600 baud, 8 data bits, 1 stop bit, odd parity.

Superior control computer transmitting the byte sequence:

Byte	Value	Explanation
	02	STX (Start of Text, start of protocol)
	„!“	transmit parameters
	03	ETX (End of Text, end of protocol)

requests the TP28850E to transmit the stored information on instrument type, required value and temperature switch state to the control computer. The TP28850E replies this prompt by singly transmitting the byte sequence:

Byte	Value	Explanation
0	02	STX (Start of Text, start of protocol)
1 bis 7	„TP28850"	information on kind of instrument
8	„S“	stored required value
9	„+“, „-“	signs of stored required value
10	„0“ bis „9“	10^3 digit, stored required value
11	„0“ bis „9“	10^2 digit, stored required value
12	„0“ bis „9“	10^1 digit, stored required value
13	„0“ bis „9“	10^0 digit, stored required value
14	„0“ bis „9“	10^{-1} digit, stored required value
15	"0"	temperature switch blocked
16	03	ETX (End of Text, end of protocol)

Inputs

Input level +/- 30 V max.
Low level: + 2.5 ... +30V
High level: -30 ... +0.8 V
Input impedance: 3...7 K
RxD Received data
CTS Clear to send

Outputs

Output level +/- 9 V, +/- 5 V min.
Low level: + 5 V min.
High level: - 5 V min.
TxD Transmitted data
RTS Request to send

3.3.4 PC terminal plan

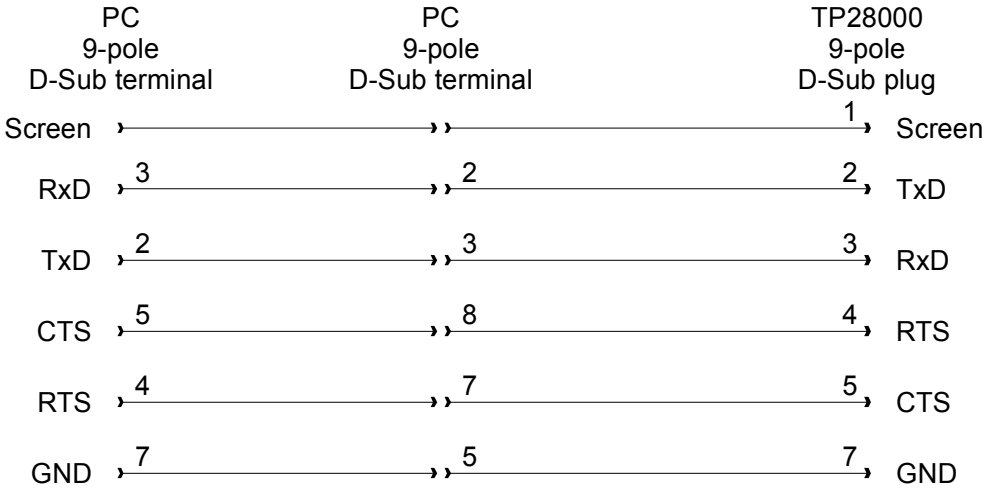

Fig. TP28850E terminal plan

3.4 Special accessories

3.4.1 Adapter sleeves

Adapter sleeves are available in various sizes upon special request.

3.4.2 Software

Efficient software is available for TP28000E series instruments. This software allows the remote control of the instrument by a superior control computer and carrying out data acquisition and evaluation. The program can be operated on all IBM compatible PC's.

4 Transport, storage and starting the instrument

4.1 Transport

The TP28850E testing instrument is a portable unit for versatile service purposes as well as for industrial and laboratory tasks. It is provided with a handle attached on its side and being brought to any position by depressing the lateral latching knobs ⑫. For bearing the instrument bring the handle into vertical position until handle locks.

Attention: For transport, e.g. to recalibration, use original packing to avoid any damage.

4.2 Storage

Store the TP28850E dust-proof and at a dry place. The ambient temperature between -10 °C and +80 °C during storage has to be warranted.

4.3 Starting the instrument

4.3.1 Proper use

Use the TP28850E exclusively for testing temperature switches, thermostats, thermocouples, thermometers and resistance thermometers within the given temperature range.

4.3.2 Expectable misuse

Ensure that the testing temperature is suitable for the specimen to prevent the specimen from being destroyed.

Caution: Remove all easily flammable media from the surrounding of the instrument and prevent the instrument from contact with easily flammable and explosive materials.

4.3.3 Positioning and connecting the TP28850E

Check-ups before starting

Attention: When positioning the instrument ensure that the fan in the instrument's bottom can supply enough air. Do not position the instrument on a soft and yielding ground.

Before starting bring the instrument in its normal operating

position.

Procedure:

- Always position the TP28850E in vertical position.
- If the TP28850E not being vertically positioned an even temperature distribution within the heating block is not warranted.
- Check specifications.
- Compare the label with specification.

Caution: Check the heating block bores for being clean and undamaged. Do not use filling media.

Check for:

- the specimen
- the adapter sleeve
- the heating block bore

exactly matching to each other.

Keep the thermal contact resistance as low as possible.

Connect the instrument to a circuit of low mains breakdown risk to avoid cooling air supply stoppage in case of mains breakdown.

Check for:

- the fan starting operation when being connected to the mains.

5 Operating the TP28850E

5.1 Operating and setting up the TP28850E

5.1.1 Before starting the TP28850E

Select place

Position the TP28850E so that there is enough space for the fan in the instrument's base to produce sufficient cooling air. Otherwise, insufficient cooling causes damage and destructs the instrument.

Note: Put the TP28850E into vertical position for calibrating to warrant optimal temperature spreading and transmission.

5.1.3 Starting the TP28850E

The testing temperature set last remains stored in the TP28850E. After starting the TP28850E the temperature of the heating block rises up to that one stored.

Procedure:

- Apply mains voltage.
  The fan in the instrument's base begins to operate.
- Turn mains switch into EIN (ON) „I".
- For some seconds "TP28850E CALIBRATION" appears on the display (Calibration of the built-in electronic). Then appears on the display „INSTRUMENT STOP START = ▼".
- Depress Down key.
  The display shows in the upper row the actual temperature of the heating block „Block:" and in the lower row the desired temperature „Set:".
  The heating block is now heated up to the testing temperature set last.

Note: For changing the set testing temperature - see paragraph „Setting the testing temperature".

5.1.4 Setting the testing temperature

Set new testing temperature as described below.

With the aid of the setpoint and start keys you can set the testing temperature with an accuracy of 1/10 K.

Procedure:

- Apply mains voltage.
- Turn mains switch into EIN (ON) „I“.

Note: Undepressed key for approx. 30 sec stops programming for safety reasons and resets the instrument on „INSTRUMENT STOP START = ▼“. Then you have to start the instrument again -see paragraph „Starting the TP28850E“.

- Depress Down key.
- Depress setpoint key.
  Testing temperature set is displayed.
- Depress Up- or Down- key frequently until the desired 1/10-value is displayed.
- Depress setpoint key.
  1/10-digit confirmed and the cursor changes to the unit place.
- Depress Up- or Down- key frequently until desired unit place is displayed.
- Depress setpoint key.
  Unit place confirmed, the cursor changes to the ten’s place.
- Depress Up- or Down- key frequently until desired ten’s place is displayed.
- Depress setpoint key.
  Ten’s place confirmed, the cursor changes to the hundred’s place.
- Depress Up- or Down- key frequently until desired hundred’s place is displayed.
- Depress setpoint key again.
  The display shows in the upper row the actual temperature of the heating block „Block:“ and in the lower row the desired temperature „Set:“.
- The heating block is heated up to the set testing temperature.

Note: If you press the Up-/Down- keys for a long time, the values at the actual cursor position are increased or decreased step by step.

Fine balancing of the testing temperature

After having programmed the TP28850E for a new required value, the heating block is heated up or cooled down to the new temperature. For reasons of external interference it can happen that the heating block does not directly attain the testing temperature set. This would mean a difference between the required temperature (testing temperature) and the actual one displayed. The TP28850E, however, has an automatic adjusting function serving for automatic difference balancing. The incorporated microprocessor is continuously calculating the actual-/required-value difference and thus controlling the heating block.

5.1.4 Block temperature stability

Block temperature stability

As long as the heating block temperature display is flashing the heating block isn't still levelled out on the set required value. In case of constant heating block temperature display the temperature is on the set level.

The microprocessor checks up the following heating block stable temperature criteria:

1. Actual heating block temperature does no longer vary (constant temperature displayed).

2. The difference between programmed actual and required temperature value is less than 0.1 K.

5.2 Cooling down heating block

Caution: Burning heat. Let the TP28850E cool down after use.

Transport the TP28850E only after being completely cooled down.

Burning heat on the specimen's surface.

Burning heat at specimen.

Never touch heating block or specimen surface.

Never leave the TP28850E unobserved after use.

Wait until the heating block has attained ambient temperature before packing the TP28850E.

It is possible to enhance cooling by zeroing the test temperature (see pragraph „Setting the test temperature“).

Remove adapter sleeves.

Caution: Burning heat. The adapter sleeves can be heated up to 850 °C. Only remove the sleeves in cooled state.

- Compress supplied sleeve grabs and fit into the adapter sleeve bores.
- Remove adapter sleeve.

6 Maintenance and Care

6.1 Care

Attention: Always keep the TP28850E clean and do not leave it in dusty and moisty rooms.

Clean the TP28850E after each use.

Attention: Avoid measuring errors by always keeping the heating block bores clean and never using filling media for measuring.

6.2 Maintenance

When switching on your TP28850E is not possible check the fuses and exchange, if necessary. Fuses inside the TP28850E housing.

Danger: Electric voltage.
Before exchanging the fuses disconnect mains plug.

Check the fuses (see pragraph „Checking and exchanging the fuses“).

Exchange fuse in case of defect.

6.2.1 Recalibration

The TP28850E is adjusted and tested by the manufacturer acc. to the accepted standards.

On the basis of the DIN ISO 10 012 standard the TP28850E has to undergo testing within fixed intervals of time.

Note: Use original packing to mail the TP28850E.

Therefore, we recommend to send the TP28850E to our factory for recalibration or readjustment within intervals of at maximum 12 months or after 500 operating hours.

6.2.2 Checking and exchanging the fuses

The TP28850E is equipped with two fuses which have to be checked and exchanged, if necessary.

1. Mains unit fuse

Check the fuse at mains input when switching on the TP28850E and in case
the fan does not start,
nothing appears on display.

Procedure:

Danger: Electric voltage, injurious to health.
Before exchanging the fuses, disconnect mains plug.

- Disconnect mains plug.
- Put instrument's topside down.
- Pull out mains cable.
- Using a screw-driver turn out mains cable cap.
- Remove cap.
  Now fuse (T12.5 250V) is visible.
- Check fuse.

Attention: Avoid destruction of the TP28850E by only using a T12.5 250V (12.5A slow, 250VAC).

- In case of defect fuse can be exchanged for spare one in the cap.
- Exchange fuse and refix cap.

2. Electronics fuse

Check electronics fuse when switching on the TP28850E and nothing appears on display.

Procedure:

Danger: Electric voltage, injurious to health.
Before exchanging the fuses, disconnect mains plug.

- Disconnect mains plug.
- Loosen all four screws on front plate.

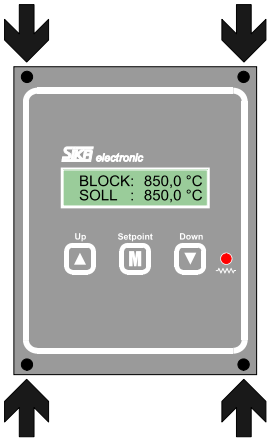

Fig. Electronics unit front plate

Note: Stiff plug-and-socket connection of electronics unit.

- Slowly pull electronics unit 1) upward until electronics is disconnected.

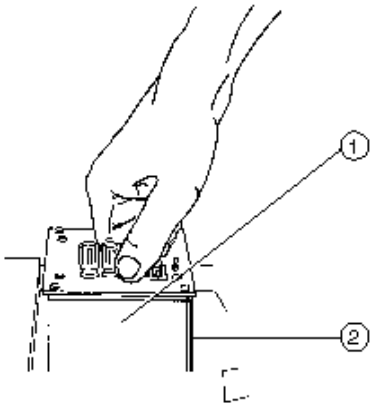

Fig. Removing electronics unit

- Remove electronics unit and reverse.
  Fuse position is now visible.

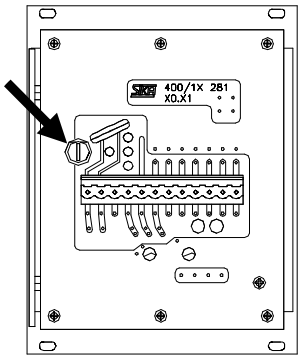

Fig. Electronics unit rear side

- Screw out fuse and check.
- In case of defect fuse always insert a new T40 250 V (40 mA slow, 250 VAC) one.
- Screw in fuse.

Note: Insert electronics unit 1) together with guide plate 2) into guide bar.

- Insert electronics and tighten.

6.2.3 Recycling

SIKA factory guarantees for expert recycling.
Therefore return the TP28850E free of charge.

7 Trouble shooting

Note: This table shows how to carry out trouble shooting.

Trouble	Cause	Remedy
TP28850E not in proper function.	External influence, e.g. magnetic fields, incorrect supply voltage.	Test applied mains voltage and compare to that one given on the label. Disconnect mains plug. Check fuses and exchange in case of defect.
TP28850E goes into standby. „INSTRUMENT STOP“ „„ START = ▼ ,“ is displayed.	Setpoint key is depressed. Programming not finished.	Again depress Down key, then TP28850E starts measuring procedure.
TP28850E goes into error position. „Block: TempError“ is displayed.	Internal heating block sensor defect.	Heating block sensor exchange at the manufacturer.
TP28850E switches off control device and goes into error position. „Block: TempError“ is displayed.	Heating block heating up to a temperature of approx. 870 °C.	Let instrument cool down and eliminate trouble.
The entire heating circuit is switched off by a temperature fuse.	The heating block heats up to a temperature of approx. 880 °C.	Let instrument cool down and eliminate trouble.

Note: In case the instrument is still in inproper function after the above trouble shooting it has to be checked at the manufacturer.

8 Specification

Setting the heating block temperature:

by required value programming

Heating and cooling times:

Heating times *)	**TP28850E/18(28)/100**
20°C to 100°C	4 min
100°C to 200°C	5 min
200°C to 300°C	5 min
300°C to 400°C	6 min
400°C to 500°C	8 min
500°C to 600°C	8 min
600°C to 700°C	10 min
700°C to 800°C	12 min
800°C to 850°C	7 min
Cooling times *)	
850°C to 800°C	3 min
800°C to 700°C	5 min
700°C to 600°C	6 min
600°C to 500°C	7 min
500°C to 400°C	10 min
400°C to 300°C	12 min
300°C to 200°C	14 min
200°C to 100°C	30 min

*) An additional levelling time has to be considered.

Heating block temperature balancing:

0.0°C...850.0°C in 1/10 K resolution

Heating block control accuracy:

+/- 0.5 K

Heating block control stability:

+/- 0.2 K

Measuring element within heating block control:

with PID-controller / Pt100

Actual value display:

2 row alphanumerical LC-display with LED-backlight
16 digit / row
5.5 mm height

Exceeding range / sensor break:

„TempError“ displayed

Sensor break for control unit:

Heating voltage switched off, „TempError“ displayed

Temperature safety system in case of exceeding limit:

2 independently operating safety devices by
approx. 870 °C und 880 °C, heating voltage switched off

Power supply / power consumption:

230 V, 50/60 Hz, approx. 2000 VA

Heating block bores:

	TP28850E	**TP28850/28E**	**TP28850/200E**	**TP28850/28/200E**
bore	∅18 mm	∅ 28 mm	∅18 mm	∅ 28 mm
depths	100 mm	100 mm	200 mm	200 mm

Adapter sleeves for smaller ∅:

available from 1.5 mm up to 15.5 mm (25 mm) ∅
in steps of 0.5 mm.

Digital interface:

RS232C, transmitting scheme:

9600 baud, 8 data bit, 1 stop bit, odd parity

Dimensions and weight:

Dimensions	**TP28850E/18(28)/100**
length, total / of instrumen	407/371 mm
total width	283 mm
total height, incl. handle and cable hairness	462/382 mm
weight	approx 16 kg